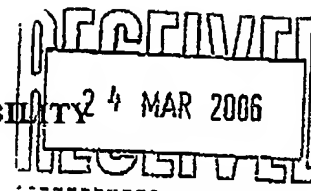


**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
 (Chapter II of the Patent Cooperation Treaty)  
 (PCT Article 36 and Rule 70)



Applicant's or agent's file reference <b>05P004:RC</b>	<div style="display: flex; justify-content: space-between;"> <span><b>FOR FURTHER ACTION</b></span> <span>See Form PCT/IPEA/416</span> </div>	
International application No. <b>PCT/AU2005/000188</b>	International filing date (day/month/year) <b>14 February 2005</b>	Priority date (day/month/year) <b>13 February 2004</b>
International Patent Classification (IPC) or national classification and IPC		
Int. Cl. <div style="display: flex; justify-content: space-around;"> <span><b>C01B 33/12 (2006.01)</b></span> <span><b>C01B 33/141 (2006.01)</b></span> </div> <div style="display: flex; justify-content: space-around;"> <span><b>B09C 1/08 (2006.01)</b></span> <span><b>C09K 17/12 (2006.01)</b></span> </div>		
Applicant <b>NUNN, Garry Robert</b>		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
- a. ☒ (sent to the applicant and to the International Bureau) a total of 3 sheets, as follows:
- ☒ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
- ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
- b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:
- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Box No. I | Basis of the report   |
| <input type="checkbox"/> Box No. II           | Priority  |
| <input type="checkbox"/> Box No. III          | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/> Box No. IV           | Lack of unity of invention  |
| <input checked="" type="checkbox"/> Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> Box No. VI           | Certain documents cited   |
| <input type="checkbox"/> Box No. VII          | Certain defects in the international application  |
| <input type="checkbox"/> Box No. VIII         | Certain observations on the international application   |

Date of submission of the demand <b>31 August 2005</b>	Date of completion of this report <b>10 February 2006</b>
Name and mailing address of the IPEA/AU <b>AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929</b>	Authorized Officer  <b>MATTHEW FRANCIS</b> Telephone No. (02) 6283 2424

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/AU2005/000188

## Box No. I Basis of the report

1. With regard to the language, this report is based on:

☒ The international application in the language in which it was filed☐ A translation of the international application into translation furnished for the purposes of:

, which is the language of a

☐ international search (under Rules 12.3(a) and 23.1 (b))☐ publication of the international application (under Rule 12.4(a))☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a)).2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:☐ the international application as originally filed/furnished☒ the description:

pages 1-33 as originally filed/furnished

pages\* received by this Authority on with the letter of

pages\* received by this Authority on with the letter of

☒ the claims:

pages as originally filed/furnished

pages\* as amended (together with any statement) under Article 19

pages\* 34-36 received by this Authority on 8 February 2006 with the letter of 8 February 2006

pages\* received by this Authority on with the letter of

☒ the drawings:

pages 1-13 as originally filed/furnished

pages\* received by this Authority on with the letter of

pages\* received by this Authority on with the letter of

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.3. ☐ The amendments have resulted in the cancellation of:☐ the description, pages☐ the claims, Nos.☐ the drawings, sheets/figs☐ the sequence listing (*specify*):☐ any table(s) related to the sequence listing (*specify*):4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).☐ the description, pages☐ the claims, Nos.☐ the drawings, sheets/figs☐ the sequence listing (*specify*):☐ any table(s) related to the sequence listing (*specify*):

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/AU2005/000188

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims 1-20	YES
	Claims	NO
Inventive step (IS)	Claims 1-20	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-20	YES
	Claims	NO

## 2. Citations and explanations (Rule 70.7)

D1: EP 301857

D2: 2001/074712

NOVELTY (N), INVENTIVE STEP (IS)

Claims 1-20: The documents, particularly D1, disclose methods of producing amorphous silica from plant sources similar to those contemplated by the invention including rice hulls and the like. D1 also discloses uses for the silica that are consistent with the claimed invention. However, both citations teach away from crystalline silica as claimed in the present claims. Hence these claims are considered both novel and inventive over the prior art.

IAP11 Rec'd PCT/PTO 10 AUG 2006

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## CLAIMS

1. A process of preparing an aqueous crystalline biogenic silica comprising the steps of:
  - a) incinerating a silica bearing organic source at a temperature from about 700°C up to about 1200°C for a time period for the silica to be substantially in a crystalline form and allowing the incinerated silica organic source to cool;
  - b) adding the incinerated and cooled silica bearing organic source to an alkaline solution that has either been preheated to a temperature up to about 65°C or to be heated with the added organic source to a temperature up to about 65°C, the alkaline solution being contained in a vessel and having a pH from 12 up to 14;
  - c) applying heat so that the added organic source and the alkaline solution in the vessel are at a temperature between 100°C and up to about 300°C for 1 to 4 hours, thereby forming an aqueous crystalline biogenic silica with a pH from 12 to 14 and undissolved impurities derived from the added organic source; and
  - d) extracting the aqueous crystalline biogenic silica from the vessel.
2. The process according to claim 1 wherein the silica bearing organic source is selected from one or a combination of two or more of group comprising rice hulls, wheat hulls, and herbs with a high level of silica.
3. The process according to claim 2 wherein the herbs include urtica dioica (stinging nettle) and Equisetum (horsetail).
4. The process according to any one of claims 1 to 3 wherein the added silica bearing organic source constitutes 2 to 22 by weight, and the alkaline solution constitute 3 to 8% by weight of an hydroxide or hydroxides and 70 to 95% by weight of water.
5. The process according to claim 4 wherein the hydroxides are selected from hydroxides of sodium, lithium, potassium, rubidium, cesium and francium.

6. The process according to claim 4 or 5 wherein the added silica bearing organic source is in a proportion of about 320g of incinerated rice hulls to the alkaline solution of about 160g of an hydroxide or hydroxides and 3 litre of water.
7. The process according to any one of claims 1 to 6 wherein the vessel is pressurised so that the heat is applied at a relatively high pressure therein.
8. The process according to claim 7 wherein the vessel has an open top which is covered by a lockable lid with a pressure release valve arranged for releasing excessive pressure within the vessel.
9. A method of remediating media containing inorganic and/or organic pollutants comprising contacting the media with a matrix generating agent having an aqueous crystalline biogenic silica obtained according to the process as claimed in one of claims 1 to 8, the matrix generating agent being arranged to generate within the media a silicate matrix having a plurality of active reactive sites for bonding to the pollutants.
10. The method according to claim 9 wherein the media is mixed with the matrix generating agent, and heating the resultant mixture at a temperature that is sufficiently high for a sufficient period to produce kerogenic compounds within said mixture.
11. The method according to claim 10 wherein the kerogenic compounds having kerogen-like or kerogenic structures of large organic geo-polymers of no particular order whereby the kerogenic compounds have an irregular structure, and comprise both aliphatic and aromatic constituents and are capable of trapping within them smaller organic and inorganic molecules.
12. The method according to claim 11 wherein the kerogenic compounds are formed by polycondensation reactions occurring at the reactive sites within the matrix, and the kerogens then become chemically bonded to the matrix and are generally insoluble in both water and most organic solvents.
13. The method according to any one of claims 9 to 12 wherein the organic pollutants include P.C.B.s, polyaromatic hydrocarbons, pesticides, herbicides, insecticides, and related compounds, halogenated solvents, furans, volatile hydrocarbons including benzene, toluene, xylene and other common organic contaminants.

14. The method according to any one of claims 9 to 12 wherein the inorganic pollutants include any of heavy metals comprising lead, cadmium, mercury, chromium, vanadium, and the like, and/or any of radioactive elements comprising uranium, strontium, thorium and other actinide, and/or any of substances containing radio active elements comprising radioactive iodine.

15. The method according to any one of claims 9 to 14 wherein the media including any of soils, sediments, sludges, water, air and other similar materials.

16. A construction material or fabric treated with the aqueous crystalline biogenic silica prepared by the process as claimed in any one of claims 1 to 8 for rendering the treated construction material or fabric with a substantially good flame retardation property and/or termite deterrent property.

17. A semi-conductor wafer manufactured with the aqueous crystalline biogenic silica prepared by the process as claimed in any one of claims 1 to 8.

18. A fertiliser for organic plants comprising the aqueous crystalline biogenic silica prepared by the process as claimed in any one of claims 1 to 8.

19. A process of removing a substantial heavy metal and/or reducing a substantial radioactive level from an animal comprising ingesting the aqueous crystalline biogenic silica prepared by the process as claimed in any one of claims 1 to 8.

20. A method of treating clay soil comprising adding to a mass of clay soil an aqueous aqueous crystalline biogenic silica prepared by the process as claimed in any one of claims 1 to 8 in a proportion of between 0.2% to 2% weight to weight of the silica to the clay soil.